

SUGGESTED SPECIFICATION
for
Low Voltage (600V) Generator Paralleling Switchboard

PART 1 GENERAL

1.1 Scope

- A. The intent of this specification is to provide power control for the parallel operation of ___ generator units (up to 4) rated ___ KW at ___ power factor, ___ volts, 3 phase, ___ wire, [50 / 60] Hertz. *[If they are all different KW's, list them separately.]* All components and testing specified or required for a complete operable system shall be included.

1.2 Application Codes and Standards

- A. UL 891 – Switchboards
B. ISO 9001:2008 – Requirements of a Quality Management System

1.3 Manufacturer's Qualifications

Automatic Transfer Switches, Bypass Switches, Paralleling Switchboards and Switchgear, Monitoring and Control shall be supplied by ASCO. The equipment described, as a minimum, shall meet all of the requirements specified in this section. The equipment shall be the product of a manufacturer who has produced paralleling electrical equipment for a period of no less than 50 years. The manufacturer must provide integral electrical and mechanical design, fabrication and construction services for all cubicle structures, formed and punched bus bar, and control panel assemblies. Comprehensive documentation detailing electrical and mechanical designs shall be available upon request. The manufacturer must be certified under ISO 9001.

1.4 Order Management

Management of orders shall be assigned to personnel employed and trained specifically and exclusively for project management; the use of field service representatives, design engineers or sales representatives for order management purposes shall not be acceptable. Each order shall be managed by both a factory-based project manager and a factory-direct field-based project manager.

1.5 Documentation

- A. Submittals for approval shall include the following:

ASCO Power Technologies, Florham Park, New Jersey 07932. 800-800-ASCO
www.EmersonNetworkPower.com/ASCO

1. Elevation drawings with shipping splits identified and estimated weights.
 2. Outline drawings showing conduit entry areas and anchoring information.
 3. Single line diagram.
 4. User Manual (including description of operation).
 5. Complete bill of material listing items by manufacturer's name, part number and description.
- B. *[Optional: One complete set of as-installed, engine and switchboard interconnect drawings, and material summary shall be provided following installation.]*
- C. Electronic documentation shall include:
1. Complete Drawings, Layouts and Schematics.
 2. Material Summary.
 3. Component Instruction.
 4. User Manual (including Description of Operation).
 5. Installation Manual.

1.6 Testing

The equipment shall be fully assembled for factory testing. Testing shall include, but not be limited to three phase 5A secondary injection testing of the current circuits. The Closed Transition Transfer Switch mechanisms supplied shall be electrically and mechanically tested. A narrative of the system operation shall be provided and shall be utilized when testing the equipment. A certified factory test report shall be furnished to verify system testing if requested.

1.7 Warranty and Service

- A. Manufacturer shall warrant the equipment for eighteen months subject to terms and conditions of manufacturer's current warranty publication.
- B. Manufacturer shall have an established network of service centers capable of servicing the equipment.
- C. Service representatives shall be on call 24 hours a day, 365 days a year. Personnel shall be factory trained and certified in the maintenance and repair of the specified equipment.
- D. Post-warranty service contracts shall be made available to the owner by the manufacturer to provide scheduled maintenance and/or emergency repair of the equipment.

1.8 General Requirements

- A. Switchboard Enclosure

1. Structure. The enclosure shall be free-standing and floor supported, with front and/or rear access as specified. An adequate number of anchor bolt holes shall be designed to place the base in direct contact with the foundation when bolted. The flatness of the floor surface upon which the equipment is installed shall deviate no more than 0.125 inches per 10 feet in any direction. All doors shall be formed from sheet stock, provided with sufficient hinges to support the door, and able to swing open more than 90 degrees. Front doors shall be supplied with a lockable handle. Rear doors, if applicable, shall be supplied. All door locks shall be keyed alike, with one key supplied for each lock. All panel covers shall be formed type, and secured with screws as necessary. The sheet steel used for the finished assembly shall be degreased and thoroughly cleaned through a minimum five stage aqueous process. The finish shall be ANSI-61, light gray, electrostatically charged powder paint over a phosphate coating, at an average of 2.0 mils thick. Finish shall be suitable for indoor and outdoor environments, enclosure Type as specified.
2. Bus. Distribution main bus shall be silver plated copper and have a maximum current density of 1000 amperes per square inch. Main bus shall be rated for [1200 / 3000 / 4000] amperes and braced appropriately.
3. Wiring. Control wiring shall be UL 1015 rated for 600 volt. Current transformer wiring terminations, where applicable, shall be ring type; shorting terminal blocks shall be included where applicable.

Control wires shall include identification every eight (8) inches or less, permanently marked with wire designations. These designations shall include the device and connection point where the wire is terminated. All wire markings shall be permanent and not noticeably fade or smudge. Low level signal circuits shall be separated and provided with shielded wire to minimize electromagnetic interference. Shielded wire shall be grounded at one point. Ethernet cabling shall be unshielded category 5 or higher.

Wires shall be placed in wire duct or harnessed, and shall be supported to prevent sagging or breakage from weight or vibration. Communication cables and current transformer circuits shall be hard wired.

All wiring to hinged doors shall be run through door terminal blocks or connection plugs except ground, CT and applicable communication wires. Terminal blocks shall be provided for all external connections and placed in an accessible area.

4. Nameplates. Permanent self-adhesive labels, having black letters on white background, shall identify major components.
5. Lugs. Lugs, if specified and supplied, shall be mechanical per size, conductor type and quantity per conductor as shown in drawings. Lug hole patterns shall be provided on supplier drawings for customer to evaluate compatibility of customer-supplied lugs.

B. Switching Mechanism

For paralleling sources, the switching mechanism shall comprise an air insulated, mechanically held, electrically operable switch comprising serviceable main and arcing contacts, wherein fixed main contacts per phase shall be segmented and articulating for improved contact with the movable solid main contacts; solenoid actuator; arcing contacts that are first make and first break; and a serviceable arc chute for dissipating load breaks. The switching mechanism shall be mounted on a vertically disposed supporting panel and front accessible for inspection, maintenance and service. The switching mechanism shall be capable of repeatedly interrupting more than six (6) times its rated current at a power factor between 0.40 and 0.50. It shall also be capable of closing on a minimum fault current of 50KA.

1.9 Acceptable Manufacturer

The equipment described shall be manufactured by ASCO Power Technologies. Any alternates to this bid shall only be considered if a complete written description of the proposed system along with any variances with the specification, are received ten (10) days prior to bid due date. Any variances not specifically enumerated prior to bidding shall be considered non-responsive. Costs incurred to modify the building and/or interfacing equipment which are affected as a result of an alternate shall be the responsibility of the contractor.

PART 2 SECTIONS

2.1 Power and Control

A. Design

Each generator section shall provide paralleling for two (2) engine-generator sets. Each engine-generator set shall be rated at ____ amperes, [3 / 4] pole.

B. Generator Control System

Each generator section shall include two (2) ASCO integrated controllers for synchronization, load sharing and transfer switch control. Applications shall allow up to four (4) engine-generator sets to be precisely controlled and paralleled. Controls shall provide soft bump-less loading and unloading of generators from the main bus. The ASCO integrated controller shall additionally provide multiple circuit interlock for first-up, first-on operation of the engine-generator set. This device shall positively prevent more than one set from being simultaneously connected to a dead bus. Upon initiation of the connection of the first set to the bus, this circuit shall shift the control of the remaining sets to automatic synchronizing.

C. Emergency Stops

The system shall include a master E-Stop push button and individual E-Stop push buttons for each engine-generator.

D. Mode Selector Switch

A three-position mode selector switch shall provide the following:

System Off. Normal shut down of an operating system.

System in Auto. Start/stop of all available generators by a single customer contact.

System On. Constantly runs all available generators.

E. Power Management Selector Switch (*optional*)

Power Management Selector Switch shall enable/disable power management applications if option is included. Power Management Applications include:

Generator Load Demand. *Add or remove generators from the bus based on the spinning reserve capacity of the power system (head room).*

Load Bus Optimization. *Add or shed loads based on load KW and spinning reserve capacity of the power system (head room).*

Gen Start on Alarm. *If a genset issues a warning alarm, this feature will start the next priority generator, add it to the bus, and remove the alarming genset.*

Generator Run Time Management. Automatically balances running time on generators, or set to intentionally unbalance running hours to stagger maintenance times.

F. Alarm and Status Indicators

Alarm and status indicators per engine-generator controller shall include:

Controls in Auto
AC Control Power
Generator CB Status
Sync Failure
Load Bus Energized

Alarm and status indicators engine-generator indicator panel shall include:

Off/Cooldown
Engine Fault
Priority 2 Load Status (optional)
Priority 3 Load Status (optional)
Priority 4 Load Status (optional)
Power Management Status (optional)

PART 3 DESCRIPTION OF OPERATION

The equipment shall conform to the operational description in the PCS 336 User Manual.

PART 4 ACCESSORIES AND FACTORY WITNESS TEST

4.1 Witness Test (optional)

An inspection and witness test of the equipment prior to shipment shall be scheduled in advance with the factory.

PART 5 INSTALLATION ASSISTANCE

The manufacturer of the generator control equipment shall provide the services of a satisfactorily trained technician to provide installation assistance.

5.1 It shall be the responsibility of the installing contractor to verify that the following items have been completed per applicable codes and standards, and are ready to perform as specified before the arrival of the factory technician.

- A. Inspect for obvious shipping damage.
- B. The equipment was properly stored (if applicable) and properly installed, anchored and grounded.
- C. Shipping splits have been reinstalled with the splits bolted together, interconnect wiring installed, and bus splice plates installed.
- D. Terminate all power cables.
- E. Install customer control wiring to external equipment including engines, batteries, building management systems, associated motor control, etc.
- F. The engine generator set is installed and ready to run.
- G. Associated motor controls, plumbing, building utilities are complete and operational.

5.2 It shall be the responsibility of the Factory Technician to perform the following:

- A. Verify contractor connections, control power availability, visually inspect all components.
- B. With the engine generator supplier's technical representative controlling the engines, verify that the CTTS and control equipment are fully operational, and performs as per the specified sequence of operation. Equipment or services shall be provided by the engine generator set supplier.
- C. With the engine generator supplier's technical representative controlling the engines, demonstrate all functions of the control system to the satisfaction of the owner or representative.
- D. Provide documentation in the form of function checklists and recorded data for each section to the owners representative.
- E. Provide plant operators with instruction on the plant operating procedures and major component maintenance after acceptance by the owner's representative.